WHAT IS CLAIMED:

1. A method for determining whether a substance binds $GABA_B$ receptors and is thus a potential agonist or antagonist of the $GABA_B$ receptor that comprises:

(a) providing cells comprising an expression vector encoding HG20 and an expression vector encoding $GABA_BR1a$ or $GABA_BR1b$;

(b) culturing the cells under conditions such that HG20 and $GABA_BR1a$ or $GABA_BR1b$ are expressed and heterodimers of HG20 and $GABA_BR1a$ or $GABA_BR1b$ are formed;

(c) exposing the cells to gabapentin in the presence and in the absence of the substance;

(d) measuring the binding of gabapentin to the heterodimers of HG20 and $GABA_BR1a$ or $GABA_BR1b$ in the presence and in the absence of the substance;

where if the amount of binding of gabapentin is less in the presence of the substance than in the absence of the substance, then the substance is a potential agonist or antagonist of $GABA_B$ receptors.

2. The method of claim 1 where:

HG20 is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:2;
Positions 9-941 of SEQ.ID.NO.:2;
Positions 35-941 of SEQ.ID.NO.:2;
Positions 36-941 of SEQ.ID.NO.:2;
Positions 38-941 of SEQ.ID.NO.:2;
Positions 39-941 of SEQ.ID.NO.:2;
Positions 42-941 of SEQ.ID.NO.:2;
Positions 44-941 of SEQ.ID.NO.:2;
Positions 46-941 of SEQ.ID.NO.:2;
Positions 52-941 of SEQ.ID.NO.:2;
Positions 57-941 of SEQ.ID.NO.:2;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AF056085;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012188;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. ASF074482; and

a chimeric HG20 protein;

where $GABA_BR1a$ is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:21;

the amino acid sequence reported in Kaupmann et al., 1997, Nature 386:239-246;:239-246;

SEQ.ID.NO.:22; and

the protein encoded by SEQ.ID.NO.:24;

where $GABA_BR1b$ is rat $GABA_BR1b$ and has the amino acid sequence reported in Kaupmann et al., 1997, Nature 386: 239-246 or is human $GABA_BR1b$ and has the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012186.

3. A method of identifying antagonists of the $GABA_B$ receptor comprising:

(a) providing cells comprising an expression vector encoding HG20 and an expression vector encoding $GABA_BR1a$ or $GABA_BR1b$;

(b) exposing the cells to gabapentin;

(c) measuring the amount of a functional response of the cells that have been exposed to gabapentin;

(d) exposing the cells concurrently to gabapentin and to a substance that is suspected of being an antagonist of the $GABA_B$ receptor;

(e) measuring the amount of a functional response of the cells that have been exposed to the substance and to gabapentin;

(f) comparing the amount of the functional response measured in step (c) with the amount of the functional response measured in step (e);

where if the amount of the functional response measured in step (c) is greater than the amount of the functional response measured in step (e), the substance is an antagonist of the $GABA_B$ receptor.

4. The method of claim 3 where:

HG20 is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:2;

Positions 9-941 of SEQ.ID.NO.:2;

Positions 35-941 of SEQ.ID.NO.:2;

Positions 36-941 of SEQ.ID.NO.:2;

Positions 38-941 of SEQ.ID.NO.:2;

Positions 39-941 of SEQ.ID.NO.:2;

Positions 42-941 of SEQ.ID.NO.:2;

Positions 44-941 of SEQ.ID.NO.:2;

Positions 46-941 of SEQ.ID.NO.:2;

Positions 52-941 of SEQ.ID.NO.:2;

Positions 57-941 of SEQ.ID.NO.:2;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AF056085;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012188;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. ASF074482; and

a chimeric HG20 protein;

where $GABA_BR1a$ is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:21;

the amino acid sequence reported in Kaupmann et al., 1997, Nature 386:239-246;:239-246;

SEQ.ID.NO.:22; and

the protein encoded by SEQ.ID.NO.:24;

where $GABA_BR1b$ is rat $GABA_BR1b$ and has the amino acid sequence reported in Kaupmann et al., 1997, Nature 386: 239-246 or is human

$GABA_BR1b$ and has the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012186.

5. A method for identifying agonists of the $GABA_B$ receptor comprising:

(a) transfecting cells with:

(1) an expression vector that directs the expression of HG20 in the cells;

(2) an expression vector that directs the expression of $GABA_BR1a$ or $GABA_BR1b$ in the cells;

(3) an expression vector that directs the expression of β-lactamase under the control of an inducible promoter that is activated by an intracellular signal generated by the interaction of agonists and the $GABA_B$ receptor;

(b) exposing the cells to a substrate of β-lactamase that is a cell-permeable dye that contains two fluorescent moieties where the two fluorescent moieties are on different parts of the dye and cleavage of the dye by β-lactamase allows the two fluorescent moietites to drift apart;

(c) measuring the amount of fluorescence resonance energy transfer (FRET) in the cells in the absence of a substance that is suspected of being an agonist of the $GABA_B$ receptor and in the absence of gabapentin;

(d) exposing the cells to the substance;

(e) measuring the amount of FRET in the cells after exposure of the cells to the substance;

(f) comparing the amount of FRET in the cells measured in step (e) to the amount of FRET measured in the cells in step (c) to obtain a value for the decrease in FRET caused by the substance;

(g) exposing the cells to gabapentin;

(h) measuring the amount of FRET in the cells after exposure of the cells to gabapentin;

(i) comparing the amount of FRET in the cells measured in step (c) to the amount of FRET measured in the cells in step (h) to obtain a value for the decrease in FRET caused by gabapentin;

comparing the decrease in FRET caused by the substance to the decrease in FRET caused by gabapentin.

6. The method of claim 5 where:

HG20 is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:2;

Positions 9-941 of SEQ.ID.NO.:2;

Positions 35-941 of SEQ.ID.NO.:2;

Positions 36-941 of SEQ.ID.NO.:2;

Positions 38-941 of SEQ.ID.NO.:2;

Positions 39-941 of SEQ.ID.NO.:2;

Positions 42-941 of SEQ.ID.NO.:2;

Positions 44-941 of SEQ.ID.NO.:2;

Positions 46-941 of SEQ.ID.NO.:2;

Positions 52-941 of SEQ.ID.NO.:2;

Positions 57-941 of SEQ.ID.NO.:2;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AF056085;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012188;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. ASF074482; and

a chimeric HG20 protein;

where $GABA_BR1a$ is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:21;

the amino acid sequence reported in Kaupmann et al., 1997, Nature 386:239-246;:239-246;

SEQ.ID.NO.:22; and

the protein encoded by SEQ.ID.NO.:24;

where $GABA_BR1b$ is rat $GABA_BR1b$ and has the amino acid sequence reported in Kaupmann et al., 1997, Nature 386: 239-246 or is human $GABA_BR1b$ and has the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012186.

7. A method of identifying antagonists of the $GABA_B$ receptor comprising:

(a) transfecting cells with:

(1) an expression vector that directs the expression of HG20 in the cells;

(2) an expression vector that directs the expression of $GABA_BR1a$ or $GABA_BR1b$ in the cells;

(3) an expression vector that directs the expression of β-lactamase under the control of an inducible promoter that is activated by an intracellular signal generated by the interaction of gabapentin and the $GABA_B$ receptor;

(b) exposing the cells to a substrate of β-lactamase that is a cell-permeable dye that contains two fluorescent moieties where the two fluorescent moieties are on different parts of the dye and cleavage of the dye by β-lactamase allows the two fluorescent moietites to drift apart;

(c) dividing the cells into a first and a second portion;

(d) exposing the first portion of the cells to gabapentin;

(e) measuring the amount of FRET in the first portion of the cells after exposure of the first portion of the cells to gabapentin;

(f) exposing the second portion of the cells concurrently to a substance that is suspected of being an antagonist of the $GABA_B$ receptor and to gabapentin;

(g) measuring the amount of FRET in the second portion of the cells after exposure of the second portion of the cells to the substance and to gabapentin;

(h) comparing the amount of FRET measured in step (e) to the amount of FRET measured in step (g) where if the amount of FRET in step (e) is less than the amount of FRET in step (g), then the substance is an antagonist of the $GABA_B$ receptor.

8. The method of claim 7 where:

HG20 is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:2;

Positions 9-941 of SEQ.ID.NO.:2;
Positions 35-941 of SEQ.ID.NO.:2;
Positions 36-941 of SEQ.ID.NO.:2;
Positions 38-941 of SEQ.ID.NO.:2;
Positions 39-941 of SEQ.ID.NO.:2;
Positions 42-941 of SEQ.ID.NO.:2;
Positions 44-941 of SEQ.ID.NO.:2;
Positions 46-941 of SEQ.ID.NO.:2;
Positions 52-941 of SEQ.ID.NO.:2;
Positions 57-941 of SEQ.ID.NO.:2;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AF056085;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012188;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. ASF074482; and

a chimeric HG20 protein;

where $GABA_BR1a$ is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:21;

the amino acid sequence reported in Kaupmann et al., 1997, Nature 386:239-246;:239-246;

SEQ.ID.NO.:22; and

the protein encoded by SEQ.ID.NO.:24;

where $GABA_BR1b$ is rat $GABA_BR1b$ and has the amino acid sequence reported in Kaupmann et al., 1997, Nature 386: 239-246 or is human $GABA_BR1b$ and has the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012186.

9. A method for identifying antagonists of the $GABA_B$ receptor comprising:

(a) transfecting cells with:

(1) an expression vector that directs the expression of HG20 in the cells;

(2) an expression vector that directs the expression of $GABA_BR1a$ or $GABA_BR1b$ in the cells;

(3) an expression vector that directs the expression of β-lactamase under the control of an inducible promoter that is repressed by at least one intracellular signal generated by interaction of gabapentin with the $GABA_B$ receptor;

(b) exposing the cells to gabapentin;

(c) exposing the cells to a substrate of β-lactamase that is a cell-permeable dye that contains two fluorescent moieties where the two fluorescent moieties are on different parts of the dye and cleavage of the dye by β-lactamase allows the two fluorescent moietites to drift apart;

(d) measuring the amount of fluorescence resonance energy transfer (FRET) in the cells in the absence of a substance that is suspected of being an antagonist of the $GABA_B$ receptor;

(e) exposing the cells to the substance;

(f) measuring the amount of FRET in the cells after exposure of the cells to the substance;

wherein if the amount of FRET in the cells measured in step (f) is less that the amount of FRET measured in the cells in step (d), then the substance is an antagonist of the $GABA_B$ receptor.

10. The method of claim 9 where:

HG20 is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:2;

Positions 9-941 of SEQ.ID.NO.:2;

Positions 35-941 of SEQ.ID.NO.:2;

Positions 36-941 of SEQ.ID.NO.:2;

Positions 38-941 of SEQ.ID.NO.:2;

Positions 39-941 of SEQ.ID.NO.:2;

Positions 42-941 of SEQ.ID.NO.:2;

Positions 44-941 of SEQ.ID.NO.:2;

Positions 46-941 of SEQ.ID.NO.:2;

Positions 52-941 of SEQ.ID.NO.:2;

Positions 57-941 of SEQ.ID.NO.:2;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AF056085;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012188;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. ASF074482; and

a chimeric HG20 protein;

where $GABA_BR1a$ is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:21;

the amino acid sequence reported in Kaupmann et al., 1997, Nature 386:239-246;:239-246;

SEQ.ID.NO.:22; and

the protein encoded by SEQ.ID.NO.:24;

where $GABA_BR1b$ is rat $GABA_BR1b$ and has the amino acid sequence reported in Kaupmann et al., 1997, Nature 386: 239-246 or is human $GABA_BR1b$ and has the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012186.

11. A method for determining if a substance is a better agonist of the $GABA_B$ receptor than gabapentin compriing:

(a) transfecting cells with:

(1) an expression vector that directs the expression of HG20 in the cells;

(2) an expression vector that directs the expression of $GABA_BR1a$ or $GABA_BR1b$ in the cells;

(3) an expression vector that directs the expression of a reporter gene under the control of an inducible promoter that is activated by an intracellular signal generated by the interaction of agonists and the $GABA_B$ receptor;

(b) exposing the cells to gabapentin;

(c) measuring the amount of signal from the reporter gene in the cells that have been exposed to gabapentin;

(d) exposing the cells to a substance that is suspected of being an agonist of the $GABA_B$ receptor;

(e) measuring the amount of signal from the reporter gene in the cells that have been exposed to the substance;

where if the amount of signal from the reporter gene in the cells measured in step (e) is greater than the amount of signal from the reporter gene measured in the cells in step (c), then the substance is a better agonist of the $GABA_B$ receptor than gabapentin.

12. The method of claim 11 where:

HG20 is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:2;

Positions 9-941 of SEQ.ID.NO.:2;

Positions 35-941 of SEQ.ID.NO.:2;

Positions 36-941 of SEQ.ID.NO.:2;

Positions 38-941 of SEQ.ID.NO.:2;

Positions 39-941 of SEQ.ID.NO.:2;

Positions 42-941 of SEQ.ID.NO.:2;

Positions 44-941 of SEQ.ID.NO.:2;

Positions 46-941 of SEQ.ID.NO.:2;

Positions 52-941 of SEQ.ID.NO.:2;

Positions 57-941 of SEQ.ID.NO.:2;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AF056085;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012188;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. ASF074482; and

a chimeric HG20 protein;

where $GABA_BR1a$ is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:21;

the amino acid sequence reported in Kaupmann et al., 1997, Nature 386:239-246;:239-246;

SEQ.ID.NO.:22; and

the protein encoded by SEQ.ID.NO.:24;

where $GABA_BR1b$ is rat $GABA_BR1b$ and has the amino acid sequence reported in Kaupmann et al., 1997, Nature 386: 239-246 or is human $GABA_BR1b$ and has the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012186.

13. The method of claim 6 where the reporter gene is selected from the group consisting of: green fluorescent protein, luciferase, and intracellular green fluorescent protein sensors.

14. A method of identifying agonists that are more potent activators of the $GABA_B$ receptor than gabapentin comprising:

(a) providing test cells comprising:

(1) an expression vector that directs the expression of HG20 in the cells;

(2) an expression vector that directs the expression of $GABA_BR1a$ or $GABA_BR1b$ in the cells;

(3) an expression vector that directs the expression of an inwardly rectifying potassium channel;

(4) a first fluorescent dye, where the first dye is bound to one side of the plasma membrane; and

(5) a second fluorescent dye, where the second fluorescent dye is free to shuttle from one face of the plasma membrane to the other face in response to changes in membrane potential;

(b) exposing the test cells to a substance that is suspected of being an agonist of the $GABA_B$ receptor;

(c) measuring the amount of fluorescence resonance energy transfer (FRET) in the test cells that have been exposed to the substance;

(d) exposing the test cells to gabapentin;

(e) measuring the amount of fluorescence resonance energy transfer (FRET) in the test cells that have been exposed to gabapentin;

wherein if the amount of FRET measured in step (c) is less than the amount of FRET measured in step (e), the substance is an agonist that is a more potent activator of the $GABA_B$ receptor than gabapentin.

15. The method of claim 14 where:

HG20 is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:2;

Positions 9-941 of SEQ.ID.NO.:2;

Positions 35-941 of SEQ.ID.NO.:2;

Positions 36-941 of SEQ.ID.NO.:2;

Positions 38-941 of SEQ.ID.NO.:2;

Positions 39-941 of SEQ.ID.NO.:2;

Positions 42-941 of SEQ.ID.NO.:2;

Positions 44-941 of SEQ.ID.NO.:2;

Positions 46-941 of SEQ.ID.NO.:2;

Positions 52-941 of SEQ.ID.NO.:2;

Positions 57-941 of SEQ.ID.NO.:2;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AF056085;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012188;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. ASF074482; and

a chimeric HG20 protein;

where $GABA_BR1a$ is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:21;

the amino acid sequence reported in Kaupmann et al., 1997, Nature 386:239-246;:239-246;

SEQ.ID.NO.:22; and

the protein encoded by SEQ.ID.NO.:24;

where $GABA_BR1b$ is rat $GABA_BR1b$ and has the amino acid sequence reported in Kaupmann et al., 1997, Nature 386: 239-246 or is human $GABA_BR1b$ and has the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012186.

16. A method of identifying antagonists of the $GABA_B$ receptor comprising:

(a) providing test cells comprising:

(1) an expression vector that directs the expression of HG20 in the cells;

(2) an expression vector that directs the expression of $GABA_BR1a$ or $GABA_BR1b$ in the cells;

(3) an expression vector that directs the expression of an inwardly rectifying potassium channel;

(4) a first fluorescent dye, where the first dye is bound to one side of the plasma membrane; and

(5) a second fluorescent dye, where the second fluorescent dye is free to shuttle from one face of the plasma membrane to the other face in response to changes in membrane potential;

(b) exposing the test cells to gabpentin in the presence of a substance that is suspected of being an antagonist of the $GABA_B$ receptor;

(c) exposing the test cells to gabpentin in the absence of the substance that is suspected of being an antagonist of the $GABA_B$ receptor;

(d) measuring the amount of fluorescence resonance energy transfer (FRET) in the test cells of steps (b) and (c);

(e) comparing the amount of FRET measured in the test cells of steps (b) and (c);

where if the amount of FRET measured in the test cells of step (b) is greater than the amount of FRET measured in the test cells of step (c), the substance is an antagonist of the $GABA_B$ receptor.

17. The method of claim 16 where:

HG20 is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:2;

Positions 9-941 of SEQ.ID.NO.:2;

Positions 35-941 of SEQ.ID.NO.:2;

Positions 36-941 of SEQ.ID.NO.:2;

Positions 38-941 of SEQ.ID.NO.:2;

Positions 39-941 of SEQ.ID.NO.:2;

Positions 42-941 of SEQ.ID.NO.:2;

Positions 44-941 of SEQ.ID.NO.:2;

Positions 46-941 of SEQ.ID.NO.:2;

Positions 52-941 of SEQ.ID.NO.:2;

Positions 57-941 of SEQ.ID.NO.:2;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AF056085;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012188;

the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. ASF074482; and

a chimeric HG20 protein;

where $GABA_BR1a$ is a polypeptide comprising an amino acid sequence selected from the group consisting of:

SEQ.ID.NO.:21;

the amino acid sequence reported in Kaupmann et al., 1997, Nature 386:239-246;:239-246;

SEQ.ID.NO.:22; and

the protein encoded by SEQ.ID.NO.:24;

where $GABA_BR1b$ is rat $GABA_BR1b$ and has the amino acid sequence reported in Kaupmann et al., 1997, Nature 386: 239-246 or is human $GABA_BR1b$ and has the amino acid sequence encoded by the DNA sequence deposited in GenBank accession no. AJ012186.

18. A method of identifying gabapentin-like agonists of the $GABA_B$ receptor comprising:

(a) determining whether a substance is able to to couple the activity of the $GABA_B$ receptor to ion channels;

(b) determining whether a substance is able to couple the activity of the $GABA_B$ receptor to changes in pigment aggregation in *Xenopus* melanophores;

where if the substance is is able to to couple the activity of the $GABA_B$ receptor to ion channels but is not able to couple the activity of the $GABA_B$

receptor to changes in pigment aggregation in *Xenopus* melanophores, then the substance is a gabapentin-like agonist of the $GABA_B$ receptor.